The Petrology of Job Charnock's Tombstone,—By Thomas H. Holland, A.R.C.S., F.G.S., *Geological Survey of India.*

[Received August 29th, Read November 1st.]

At the suggestion of the Rev. H. B. Hyde, I recently examined the tombstone preserved in the 'Charnock Mausoleum,' St. John's Churchyard, to the memory of Job Charnock.* Apart from its historic interest, the rock itself, being of a type hitherto undescribed, is of sufficient scientific value to call for a description.

The abundance of blue quartz, the occasional crystals of garnet, the black, and sometimes bronzy-looking, pyroxene, and the cleavage faces of the felspars are characters which are at once striking features in the hand-specimen.

Under the microscope, the rock is seen to be granitic in structure ; that is, it is perfectly crystalline throughout, with the crystals mutually interlocked, and the intergrowth so perfect that in places a beautiful micro-pegmatitic structure results. The following minerals can be identified (1), Quartz. (2), Orthoclase (Microcline). (3), Plagioclase. (4), Hypersthene. (5), Garnet, and (6), Magnetite.

(1.) The QUARTZ-CRYSTALS are crowded with minute acicular inclusions, the structure of which cannot be made out with the microscope ; they are arranged without discoverable regularity : and are probably the cause of the blue colour seen in hand-specimens. Blue quartz-crystals have been noticed before in granites and granitites, as in that from Rumburg in Sweden.

(2). ORTHOCLASE and MICROCLINE. Most of the potash-felspars show the remarkable and unmistakable microcline structure. Occasionally also the orthoclase is seen presenting the "streifige" appearance due to regularly arranged intergrowths with a plagioclase, giving rise to the structure described by Becke as micro-perthitic. To prove the identity of this felspar I have isolated crystals having a specific gravity of 2·59, and examined them chemically by Szabo's method.

(3). PLAGIOCLASE occurs only in small quantities. The isolated crystals show the characteristic twinning, with extinction-angles approaching those of oligoclase.

(4). HYPERSTHENE occurs, not in large quantities, but presenting its characteristic pleochroism and straight extinction. The presence of this mineral is a feature of exceptional interest from the fact that, so far as I am aware, a hypersthene-granite has never before been record-

* Job Charnock died in 1693, and the tombstone was erected about two years later.

ed, although the mineral has been frequently found as a constituent of the intermediate, basic and ultra-basic holocrystalline rocks. The precise reasons why the micas, hornblendes, and, more rarely, augites should occur as the ferro-magnesian constituents of granites, and not hypersthene, have never been accurately settled. The discovery of hypersthene, therefore, in this capacity fills a very well-marked gap in the granitic series, and for the time we can do no more than record as precisely as possible its nature and mode of occurrence, with the hope that in future the facts may be of service in framing an hypothesis for explaining the fact that chemically similar magmas, under special conditions of temperature and pressure during the process of consolidation, give rise to different mineral species.

(5). GARNET of the almandine variety occurs very sparingly in the rock, and seldom shows anything approaching idiomorphic crystalline form.

(6). MAGNETITE in small grains is sparsely scattered amongst the other minerals.

The rock has a *specific gravity* of 2·646, agreeing thus with normal granites.

In microscopic and macroscopic characters this rock agrees with certain specimens which I have recently collected in the Madras Presidency. At different places in the south of India (Pallavaram in the Chingleput district, the Shevaroy and Nilgiri hills, in N.-W. Madura, and in Travancore) there occur exposures of igneous rock in which hypersthene is a constant constituent, and which at the same time exhibit every gradation in acidity, from hypersthene-granite, the most silicious (acid), to pyroxenite the most basic. These rocks, although their exposures are now separated by such distances from one another, I believe to have been derived from a common molten magma: they belong to one "petrographical province," and the differentiation of the originally homogeneous molten material into masses so widely distinct in chemical composition can be shown to be in agreement with well-established, though recent, physical principles.

The massive rocks of the Nilgiri Hills, and the Shevaroys, as well as the similar rocks found in the localities mentioned above, have been hitherto regarded as belonging to the great metamorphic series of the South. Observations made during recent visits to the Madras Presidency have, however, convinced me that this series, together with certain others not now under discussion, must be looked upon as intrusive igneous rocks of younger age than the normal gneiss.

The evidences for these conclusions I hope shortly to produce in detail. For the present, however, we are concerned in identifying

Job Charnock's tombstone with the pypersthene-granites of the Madras Presidency; and from its proximity to the cost and to Madras, it seems likely that Pallavaram would have been selected by the earlier agents of the East India Company as a source of this handsome rock. Nearly all the old tombstones collected together in St. John's Churchyard are of the same rock; for example that of Job Charnock's son-in-law, Jonathan White (1703), and Mrs. Jane Smart (1753).

Briefly, the points in which these rocks agree with those of Pallavaram, and upon which I base this identification, are these :—

(a). *Structure* :—

(1). Micro-perthitic structure.

(2). Granophyric (micro-pegmatitic) structure.

(b). *Composition* :—

(1). The presence of potash-felspar in the form of microcline.

(2). „ hypersthene.

(3). „ blue quartz.

(4). „ almandine garnet.

(c). *The combination* of these minerals with the above-named structures. In this association hypersthene is especially note-worthy for the reasons already stated.

As this is a new type of rock, and modifications of it occur by the introduction of accessory minerals, I would suggest for it the name *Charnockite*, in honour of the founder of Calcutta, who was the unconscious means of bringing, perhaps, the first specimen of this interesting rock to our capital.

On a slab of Chinese agglomerate lava bearing a Chinese inscription discovered in St. John's Churchyard, Calcutta. *By* T. H. Holland, A.R.C.S., F.G.S., *Geological Survey of India.*

[Received October 26th;—Read November 1st, 1893.]

(With Plate VII.)

Through the kindness of the Revd. H. B. Hyde, I have been enabled to examine the slab bearing a Chinese inscription and discovered by him in St. John's Churchyard.

The slab has been imperfectly polished on the face bearing the inscription, and at first sight presents the character of a common artificial concrete, for which I at first mistook it. But on removing a fragment from the back of the slab and examining it in the laboratory, I found it